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12/18/2006

Thomas Behr

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EXAMINER

TAOUSAKIS, ALEXANDER P

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.



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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/573,273  
Filing Date: December 18, 2006  
Appellant(s): BEHR ET AL.

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Stephan A. Pendorf  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 03/28/2011 appealing from the Final Office action mailed 10/26/2010.

**(1) Real Party in Interest**

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The following is a list of claims that are rejected and pending in the application:

Claims 4-5, 7-10 and 11-14.

**(4) Status of Amendments After Final**

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

**(5) Summary of Claimed Subject Matter**

The examiner has no comment on the summary of claimed subject matter contained in the brief.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the

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subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

**(7) Claims Appendix**

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

**(8) Evidence Relied Upon**

WO 0047362	Hoyes et al	8-2000
6,258,180	Wilde et al	7-2001
2002/0098392	Oyelayo et al	7-2002
5,409,415	Kawanami et al	4-1995
2,815,682	Kolbe et al.	12-1957

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

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2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 4-5, 7-9, and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoyes et al (WO 0047362) in view of Wilde et al (6,258,180), further in view of Oyelayo et al (2002/0098392).**

4-5 Hoyes et al teaches a diesel powered vehicle, wherein the diesel engine includes a crankshaft with combined drive gear wheel (*see Figure 1, Page 1 lines 1-2, and note that it is inherent that the diesel engine will be used for a diesel vehicle*), and wherein the crankshaft and gear wheel are hardened (*see Page 1 lines 21-22*).

The limitations, “wherein the hardness of the gear wheel is further increased by local differential thermal treatment during ADI heat treatment and/or by peening, wherein both the crankshaft and drive gear wheel are cast as one piece” is being treated as a product by process limitation. As set forth in MPEP 2113, product by process claims are NOT limited to the manipulations of the recited steps, only to the structure implied by the steps. Once a product appearing to be substantially the same or similar is found, a 35 U.S.C. 102/103 rejection may be made and the burden is shifted to applicant to show an unobvious difference See MPEP 2113.

The structure implied by the above process steps is a crankshaft combined with a drive gear wheel manufactured from tempered ductile iron (ADI), has been heat treated and at least the gear teeth having a carbide containing coating (CADI).

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Hoyes et al fail to teach wherein the crankshaft and drive gear wheel are manufactured from tempered ductile iron (ADI) and have a carbide containing coating (CADI).

Wilde et al teaches producing a crankshaft out of an austempered ductile iron (*see column 2 lines 55-60, where it discloses producing crankshafts, and see column 4 lines 4-12*).

Oyelayo et al teach a carbide coating deposited on gear teeth (*see [0029]*).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to produce the crankshaft/drive gear wheel of Hoyes et al out of an austempered ductile iron, as taught by Wilde et al, because it has exceptional strength and toughness (*see Wilde et al column 2 lines 23-25*). Furthermore, it would have been obvious to provide a carbide coating onto the gear teeth of Hoyes et al, as taught by Oyelayo et al, because it will increase its surface hardness and wear resistance.

7 and 11. Hoyes et al/Wilde et al/Oyelayo et al teach the product of claim 4, wherein the gear wheel is hardened (*see Hoyes et al page 2 lines 8-12*) and note that “wherein the hardness of the gear wheel is further increased by local differential thermal treatment during ADI heat treatment” is being treated as a product by process limitation. Once a product appearing to be substantially the same or similar is found, a 35 U.S.C. 102/103 rejection may be made and the burden is shifted to applicant to show an unobvious

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difference See MPEP 2113. The resulting structure of thermal treatment is a heat treated gear wheel, which Hoyes et al meets. Note that including the term "local" before thermal treatment does not further limit the claim because the heat treatment can be "local" to the entirety of the gear wheel and crankshaft as it does state that the combined gear wheel itself is being hardened.

8, 9, 12, 13. Hoyes et al/Wilde et al/Oyelayo et al teach the product of claims 7 and 11, but fail to teach wherein carbide is within the microstructure of the combined gear wheel and crankshaft. Note that the claim is being treated as a product by process claim, as described above, and the resulting structure is carbides throughout the thickness of the part.

Wilde et al teaches uniformly dispersing carbides throughout the microstructure of an ADI part to form a part having carbides throughout its thickness (*see column 3 lines 66-67 – column 4 lines 1-12*).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to create a part having carbides within its microstructure, as taught by Wilde et al, because it improves hardness and wear resistance (*see Wilde et al column 1 lines 64-65*).

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**Claims 10 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoyes et al (WO 0047362) in view of Wilde et al (6,258,180), further in view of Oyelayo et al (2002/0098392) as applied to claims 4 and 5 above, further in view of Kawanami et al (5,409,415).**

10 and 14. Hoyes et al/Wilde et al/Oyelayo et al teach the product of claims 4 and 5, but fail to teach shot peening the combined gear wheel.

Kawanami et al teaches shot peening a gear wheel to form a shot peened gear wheel (*see column 7 lines 56-68 - column 8 lines 1-4*).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a shot peened gear wheel, as taught by Kawanami et al, because it prolongs the fracture limit due to fatigue, stress corrosion or intergranular corrosion of the metal (*see Kawanami et al column 8 lines 1-4*).

### **New Grounds of Rejection**

**Claims 4-5, 7-9, and 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoyes et al (WO 0047362) in view of Kolbe et al (2,815,682), Wilde et al (6,258,180), and Oyelayo et al (2002/0098392).**

4-5 Hoyes et al teaches a diesel powered vehicle, wherein the diesel engine includes a crankshaft with combined drive gear wheel formed as an integral unit by forging (*see Figure 1, Page 1 lines 1-2, and note that it is inherent that the diesel engine will be used*



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*for a diesel vehicle; and Page 1 lines 19-23), and wherein crankshaft and gear wheel are hardened (see Page 1 lines 21-22).*

The limitations, “wherein the hardness of the gear wheel is further increased by local differential thermal treatment during ADI heat treatment and/or by peening, wherein both the crankshaft and drive gear wheel are cast as one piece” is being treated as a product by process limitation. As set forth in MPEP 2113, product by process claims are NOT limited to the manipulations of the recited steps, only to the structure implied by the steps. Once a product appearing to be substantially the same or similar is found, a 35 U.S.C. 102/103 rejection may be made and the burden is shifted to applicant to show an unobvious difference See MPEP 2113.

The structure implied by the above process steps is a crankshaft combined with a drive gear wheel manufactured from tempered ductile iron (ADI), has been heat treated and at least the gear teeth having a carbide containing coating (CADI). ***However, in light of applicant’s arguments pertaining to the alleged structural differences between forging and casting, Kolbe et al. is presented in this new grounds of rejection to show that it is well known in the art that the selection between casting or forging a crankshaft is obvious to one of ordinary skill in the art.***

Hoyes et al fail to teach wherein the crankshaft and drive gear wheel are casted and manufactured from tempered ductile iron (ADI) and have a carbide containing coating (CADI).

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Kolbe et al teaches a crankshaft (10) which may be either forged or casted (*see column 2 lines 11-12*).

Wilde et al teaches producing a crankshaft out of an austempered ductile iron (*see column 2 lines 55-60, where it discloses producing crankshafts, and see column 4 lines 4-12*).

Oyelayo et al teach a carbide coating deposited on gear teeth (*see [0029]*).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to cast the crankshaft/drive gear wheel of Hoyes et al, as taught by Kolbe et al, because it is well known to produce crankshaft using either method and Kolbe et al teaches that either process is sufficient. Further, casting provides the additional benefit of increasing production, as opposed to forging, because the final shape is immediately formed, as opposed to a forging operation, which is much more time consuming and involves multiple steps. It would have been obvious to one of ordinary skill in the art at the time the invention was made to produce the crankshaft/drive gear wheel of Hoyes et al out of an austempered ductile iron, as taught by Wilde et al, because it has exceptional strength and toughness (*see Wilde et al column 2 lines 23-25*).

Furthermore, it would have been obvious to provide a carbide coating onto the gear teeth of Hoyes et al, as taught by Oyelayo et al, because it will increase its surface hardness and wear resistance.

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7 and 11. Hoyes et al/Kolbe et al/Wilde et al/Oyelayo et al teach the product of claim 4, wherein the gear wheel is hardened (*see Hoyes et al page 2 lines 8-12*) and note that "wherein the hardness of the gear wheel is further increased by local differential thermal treatment during ADI heat treatment" is being treated as a product by process limitation. Once a product appearing to be substantially the same or similar is found, a 35 U.S.C. 102/103 rejection may be made and the burden is shifted to applicant to show an unobvious difference See MPEP 2113. The resulting structure of thermal treatment is a heat treated gear wheel, which Hoyes et al meets. Note that including the term "local" before thermal treatment does not further limit the claim because the heat treatment can be "local" to the entirety of the gear wheel and crankshaft as it does state that the combined gear wheel itself is being hardened.

8, 9, 12, 13. Hoyes et al/Kolbe et al/Wilde et al/Oyelayo et al teach the product of claims 7 and 11, but fail to teach wherein carbide is within the microstructure of the combined gear wheel and crankshaft. Note that the claim is being treated as a product by process claim, as described above, and the resulting structure is carbides throughout the thickness of the part.

Wilde et al teaches uniformly dispersing carbides throughout the microstructure of an ADI part to form a part having carbides throughout its thickness (*see column 3 lines 66-67 – column 4 lines 1-12*).

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It would have been obvious to one of ordinary skill in the art at the time the invention was made to create a part having carbides within its microstructure, as taught by Wilde et al, because it improves hardness and wear resistance (*see Wilde et al column 1 lines 64-65*).

**Claims 10 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoyes et al (WO 0047362) in view of Kolbe et al (2,815,682), in view of Wilde et al (6,258,180), further in view of Oyelayo et al (2002/0098392) as applied to claims 4 and 5 above, further in view of Kawanami et al (5,409,415).**

10 and 14. Hoyes et al/Wilde et al/Oyelayo et al teach the product of claims 4 and 5, but fail to teach shot peening the combined gear wheel.

Kawanami et al teaches shot peening a gear wheel to form a shot peened gear wheel (*see column 7 lines 56-68 - column 8 lines 1-4*).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a shot peened gear wheel, as taught by Kawanami et al, because it prolongs the fracture limit due to fatigue, stress corrosion or intergranular corrosion of the metal (*see Kawanami et al column 8 lines 1-4*).

**(10) Response to Argument**

Argument 1:

The Examiner improperly maintained the restriction requirement between process claims 3 and 6 and the remaining product-by-process claims as:

(a) A decision has already been made with respect to unity of invention by the International Search Authority and should stand.

(b) Examiner incorrectly indicated that the special technical features common to all claims are a combined crankshaft and drive gear wheel which has been heat treated and has a carbide layer, instead the special technical features are: both the crankshaft and drive gear wheel are cast as one piece, exhibit differential hardening, are manufactured from tempered ductile iron, the hardness of which is increased by one of (a) local differential thermal treatment or (b) peening, and where the friction wear resistance is increased by application of a carbide containing coating, and the combination of Hoyes et al and Oyelayo fails to teach these special technical features.

Response:

Restriction requirements are not appealable, they are only petitionable and should not be decided on appeal.

Argument 2:

The Examiner fails to establish a combined crankshaft and gear wheel casted as a single piece, but instead teaches forging then cutting to form gear teeth, resulting in a different microstructure than the claimed invention.

Response:

Hoyes et al (WO 00/47362) discloses forging a combined crankshaft and gear wheel as a unitary unit, i.e. combined crankshaft and gear wheel (*see Abstract and page 1 lines 16-22*). Please see the above rejection, which provides that it is well known to produce crankshafts by both casting and forging, and therefore the two processes are interchangeable. One of ordinary skill in the art would cast the combined crankshaft and gear wheel to increase production and efficiency of the process, but would instead forge the unit to increase its strength. Therefore either casting or forging may be used to produce the combined crankshaft and gear wheel of Hoyes et al. Appellant also states that the claimed invention has different microstructure than what would be produced from the combination as presented in the Office Action dated 10/26/2010. This is not found persuasive because the Appellant has failed to provide evidence that a casted part would have a different microstructure than a forged part. Appellant has also failed to positively claim said microstructure.

Also note that Appellant has explained the difference between a one-piece cast structure and a two piece joined structure. This argument is not relevant because Hoyes et al discloses a forged unitary structure comprising a crankshaft and gear wheel (*see page 1 lines 16-22*).

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Argument 3:

Appellant argues that cutting into a forged crankshaft/gearwheel, as taught by Hoyes et al, provides a different structure than having the gear teeth formed during the casting process, as claimed.

Response:

This is not found persuasive because the claims do not require that the gear teeth are casted, but instead allow for a machining operation to form gear teeth, such as the cutting operation of Hoyes et al. Independent Claims 4 and 5 recite "wherein both crankshaft and drive gear wheel are cast as one piece." This limitation does not require that gear teeth are formed, and actually completely fails to mention gear teeth at all. Therefore, Claims 4 and 5 allow for a combination gear wheel and crankshaft to be casted without any gear teeth, thus the Appellant's argument regarding the difference in microstructure between the claimed invention and the cut gear teeth of Hoyes et al is non-persuasive.

Argument 4:

Appellant argues that Hoyes et al fail to disclose a crankshaft that exhibits three different areas of hardening due to the casting, the differential hardening of the combination, and the local differential treatment/peening operations, and that the uniform heat treatment of the crankshaft and gear wheel unit will result in a different microstructure than the claimed invention.

Response:

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This is not found persuasive because the Appellant has failed to provide evidence to support the contention that the heat treatment of Hoyes et al will result in a different microstructure than the claimed hardening operations. Appellant has failed to provide support in the Specification that the recited steps would result in a different microstructure than the heat treatment operation of Hoyes et al. Therefore, Appellant has failed to define said microstructure so that one of ordinary skill in the art could differentiate between Appellant's claims and the prior art in view of Hoyes et al. MPEP 2113 states that product by process claims are not limited to the manipulations of the recited steps, but only to the implied structure. The resulting structure of the implied steps is a combined crankshaft and drive gear wheel made from tempered ductile iron, which has been heat treated and a carbide containing coating has been applied to at least the gear wheel teeth.

Argument 5:

Appellant argues that since the gear teeth of Hoyes et al are cut, any application of a carbide coating would not survive.

Response:

This is not found persuasive because the combination of Hoyes et al and Oyelayo et al (2002/0098392), by one of ordinary skill in the art, would result in a carbide coating that is applied to formed gear teeth, i.e. after the cutting operation of Hoyes et al has taken place. Oyelayo et al teach placing a gear having gear



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teeth into a chamber to deposit a boron carbide coating thereon (*see paragraph [0029]*). The combination of Hoyes et al and Oyelayo et al result in the *entire* combined gear wheel and crankshaft being coated with the boron carbide coating. Independent claims 4 and 5 of the present invention do not preclude a coating that is applied to the entire unit, but instead require that *at least* the gear teeth are coating with an application of "carbon containing coatings."

Argument 6:

Appellant argues that the rejection fails to teach incorporating carbide into the alloy.

Response:

Wilde et al teaches uniformly dispersing carbides throughout the microstructure of an ADI part to form a part having carbides throughout its thickness (see column 3 lines 66- 67- column 4 lines 1-12).

Argument 7:

Appellant argues that Oyelayo fails to teach incorporating a carbide coating into the gear wheel/crankshaft alloy, and is not capable of selectively hardening just the gear teeth.

Response:

The claims do not positively claim selectively hardening only the gear teeth, but instead may allow for hardening of the gear teeth along with other parts

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of the assembly. Oyelayo et al teach placing a gear having gear teeth into a chamber to deposit a boron carbide coating thereon (*see paragraph [0029]*). The combination of Hoyes et al and Oyelayo et al result in the *entire* combined gear wheel and crankshaft being coated with the boron carbide coating. Independent claims 4 and 5 of the present invention do not preclude a coating that is applied to the entire unit, but instead require that *at least* the gear teeth are coating with an application of "carbon containing coatings."

Argument 8:

The recitation of "local" differentially hardening refers to the gear wheel and not the entire part.

Response:

Applicant's recitation of "local" can be interpreted to be local to a specific area, treatment of the gear wheel itself is "local," as the gear wheel is attached to the crankshaft and treatment to the gear wheel is selective.

Furthermore, Applicant has failed to provide evidence of any structural differences from a differentially treated part and a uniformly heat treated part. As such, there are no structural differences in a combined crankshaft and gear wheel which are treated by these two methods, and since the elected claims are product-by-process claims, they are only limited to the structure implied by the steps. See MPEP 2113.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

This examiner's answer contains a new ground of rejection set forth in section **(9)** above. Accordingly, appellant must within **TWO MONTHS** from the date of this answer exercise one of the following two options to avoid *sua sponte* **dismissal of the appeal** as to the claims subject to the new ground of rejection:

(1) **Reopen prosecution.** Request that prosecution be reopened before the primary examiner by filing a reply under 37 CFR 1.111 with or without amendment, affidavit or other evidence. Any amendment, affidavit or other evidence must be relevant to the new grounds of rejection. A request that complies with 37 CFR 41.39(b)(1) will be entered and considered. Any request that prosecution be reopened will be treated as a request to withdraw the appeal.

(2) **Maintain appeal.** Request that the appeal be maintained by filing a reply brief as set forth in 37 CFR 41.41. Such a reply brief must address each new ground of rejection as set forth in 37 CFR 41.37(c)(1)(vii) and should be in compliance with the other requirements of 37 CFR 41.37(c). If a reply brief filed pursuant to 37 CFR 41.39(b)(2) is accompanied by any amendment, affidavit or other evidence, it shall be treated as a request that prosecution be reopened before the primary examiner under 37 CFR 41.39(b)(1).

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Extensions of time under 37 CFR 1.136(a) are not applicable to the TWO MONTH time period set forth above. See 37 CFR 1.136(b) for extensions of time to reply for patent applications and 37 CFR 1.550(c) for extensions of time to reply for ex parte reexamination proceedings.

Respectfully submitted,

/ALEXANDER P TAOUSAKIS/

Examiner, Art Unit 3726

**A Technology Center Director or designee must personally approve the new ground(s) of rejection set forth in section (9) above by signing below:**

/DONALD T HAJEC/

Director, Technology Center 3700

Conferees:

/DAVID P. BRYANT/

Supervisory Patent Examiner, Art Unit 3726

/BOYER D ASHLEY/

Supervisory Patent Examiner, Art Unit 3724